

## Rocky Mountain Bighorn Sheep (*Ovis canadensis canadensis*)

### Indicator Species Habitat

Rocky Mountain (RM) bighorn sheep inhabit the cliffs and crags or other extremely rocky areas in tundra and alpine areas from the summit peaks to around 200 meters below the tree line of the Sangre de Cristo Mountains. The species is an indicator for the presence of alpine, subalpine tundra and mountain meadow grassland (USDA 1986a, p.97). Bighorn prefer precipitous terrain adjacent to suitable feeding sites of high mountain meadows with grasses, forbs and browse species. Bighorn habitat is found in areas where canopy cover is less than 25 to 30 percent and slopes are greater than 60 percent for escape terrain adjacent to grazing areas. Forage, water, and escape terrain are the most important components of bighorn sheep habitat (Van Dyke et al. 1983).

Generally, bighorn sheep have two distinct, separate summer and winter ranges (Chapman et al 1982). Most of the year is spent on the winter range, where the elevation is typically below 10,826 feet (3,300 m). The aspect is usually south or southwest. Rams often venture onto the more open slopes, although rugged terrain is always nearby. During severe weather, if snow becomes unusually deep or crusted, bighorn sheep move to slightly higher elevations where wind and sunshine have cleared the more exposed slopes and ridges (Chapman et al 1982).

The spring range is generally characterized by the same parameters as the winter range. However, bighorn sheep begin to respond to local greenups along streambanks and valleys. Bighorn sheep use areas around saltlicks heavily in the spring. Preferred lambing range is in the most precipitous, inaccessible cliffs near forage, and generally has a dry, southern exposure (Chapman et al 1982).

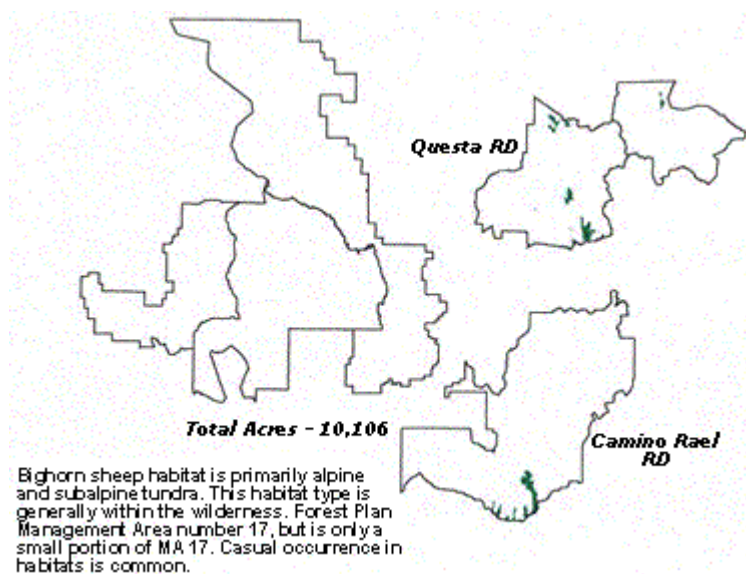
In the summer, bighorn sheep are mostly found grazing on grassland meadows and plateaus above timber. In early summer south and southwestern exposures are most frequently utilized. By late summer the more northerly exposures are preferred (Chapman et al 1982). Snow accumulation seems to be the principal factor that triggers bighorn sheep to move from summer to winter ranges (Van Dyke et al. 1983).

Bighorn sheep obtain water from dew, streams, lakes, springs, ponds, catchment tanks, troughs, guzzlers, and developed seeps or springs (Van Dyke et al. 1983). Alkaline water is not suitable. Bighorn sheep spend most of their time within 1 mile (1.6 km) of water but have been located as far as 2 miles (3.2 km) from water. Water sources more than 0.3 mile (0.5 km) from escape terrain or surrounded by tall dense vegetation are avoided by bighorn sheep.

Escape terrain is an important habitat requirement for bighorn sheep. Cliffs, rock rims, rock outcroppings, and bluffs with sparse cover of trees or shrubs typify escape habitat, which provides both thermal and hiding cover. While bighorn sheep are not always found in precipitous mountain areas, ewes and lambs rely on these areas for escape cover, especially during the lambing period (Chapman et al 1982, Van Dyke et al. 1983, Woodard et al. 1990). Visibility is another important habitat component for bighorn sheep. It allows for predator detection, visual communication, and efficient foraging (Boyd et al. 1986). Bighorn sheep tend to forage in open areas with low vegetation such as grasslands, shrublands, or mixes of these. They avoid foraging on mild slopes with shrub or canopy cover in excess of 25 percent and shrubs 2 feet (60 cm) or higher. On steep slopes they have been noted to travel through or bed in dense brush (Van Dyke et al. 1983).

Bighorn sheep primarily graze grasses and forbs, but eat other vegetation depending on availability (Chapman et al. 1982). They prefer green forage and move up- or downslope or to different aspects for more palatable forage. Forage areas that provide a variety of aspects are preferable because they provide green forage for longer periods (Van Dyke et al. 1983). Bighorn sheep eat sedges and a variety of grasses including bluegrasses (*Poa* spp.), wheatgrasses, bromes, and fescues. Browse species include sagebrush, willow (*Salix* spp.), rabbitbrush, curleaf mountain-mahogany (*Cercocarpus ledifolius*), winterfat (*Kraschnennikovia lanata*), bitterbrush, and green ephedra (*Ephedra* spp.). Forbs include phlox (*Phlox* spp.), cinquefoil (*Potentilla* spp.), twinflower (*Linnaea borealis*), and clover (*Trifolium* spp.) (Stelfox, John G. 1976, Chapman et al. 1982).

On the Carson National Forest, Rocky Mountain bighorn sheep are regularly observed along the highest (11,000-13,000 feet) ridges in the Pecos and Wheeler Peak wilderness areas (USDA 1987). As displayed on a map of the Carson National Forest, the potential habitat for the RM bighorn sheep is limited to the east side of the Forest.



**Map 1. Rocky Mountain Bighorn Potential Habitat Distribution on the Carson National Forest (USDA 1987)**

### **Management Activities or Natural Events That May Affect Habitat**

Negative: Recreation use, domestic sheep grazing, road use, fences, poor range conditions, excessive fire suppression, wild fire, severe winters, diseases specific to sheep, illegal harvest and predation (Dunn 1997).

Positive: Fire use (prescribed natural fire), possibly wildfire and good grazing practices.

### **Plans, Regulations and Guidelines Supporting, Maintaining or Improving Habitat**

- *Carson National Forest Land and Resource Management Plan, Management Area 9 (High Elevation Grassland).* "Provide quality habitat for Rocky Mountain bighorn sheep."
- *Long Range Plan for the Management of Rock Mountain Bighorn Sheep in New Mexico (1996)*

- *Wilderness Act (1964)*

## Habitat Condition And Trend On The Carson National Forest

In New Mexico, suitable range is relatively limited. It is believed that bighorn sheep once occupied alpine ranges in most of New Mexico, implying that the Pecos, Latir Peak, Wheeler Peak and Gold Hill areas of the Carson National Forest are historic ranges. The westside of the Carson NF lacks the high elevation, rugged habitat of cliffs, crags and rocky areas required to support a viable population of bighorn sheep.

The Forest Plan EIS identifies 20,430 acres of occupied bighorn sheep habitat on the Carson National Forest (USDA 1986a, p. 97). Based on Terrestrial Ecosystem Survey data, Map 1 displays only the alpine tundra portion (~ 10,100 acres) of bighorn habitat (USDA 1987). The Forest Plan EIS includes other adjacent alpine habitats; therefore the acres in Map 1 cannot be used in a habitat trend analysis. The core portions of bighorn habitat, however, can be located using Map 1, until a new map depicting a more accurate range of the species can be made available and incorporated into this document.

The Forest Plan EIS considered the bighorn herd in the Pecos Wilderness to be unstable and that a downward trend was expected (primarily due to lungworm-pneumonia disease) (USDA 1986a, p. 98). Conversely, populations have done very well on the Forest and several relocations have been successful (see discussion under Population Trend).

There has been only one management activity that has significantly changed potential habitat during the period of the Forest Plan. The removal of domestic sheep from the Latir Peak range has without doubt increased the habitat quality, but it is not certain if the acres identified in the Forest Plan included this area. **The habitat trend for Rocky Mountain bighorn on the Carson National Forest is estimated to be stable or slightly increasing.**

Reproduction is high and mortality of young has not been significant for all the existing bighorn sheep herds on the Forest. The Pecos and Wheeler Peak herds quickly reached and remain at carrying capacity for their range. The Latir herd is expected to do the same in the next few years. The Columbine/Hondo Wilderness Study Area herd also grew from animals released in Wheeler Peak Wilderness (NMDGF correspondence). If this trend stays consistent, the actual occupied range may gradually increase although there are natural limits.<sup>1</sup> As herd size goes over the carrying capacity of the habitat, it becomes more vulnerable to large-scale die-offs and lower birth weight.

Since bighorn are highly susceptible to the diseases carried by domestic sheep, the viability of the species is dependent on whether or not domestic sheep are present within their occupied habitat. In the Pecos and Wheeler Peak areas and just recently in the Latir Peak region, domestic livestock have been converted from sheep to cattle in order to prevent any *Pasturella* bacteria infection of bighorn sheep. The cows on the allotment at the north end of the Pecos Wilderness rarely if ever access bighorn sheep habitat. This type of interaction occurs only periodically during the winter months when the livestock are off the allotment and conditions are severe enough to push bighorn down below their normal or preferred habitat onto private land.

Suitable feeding sites of high mountain meadows with grasses, forbs and browse species provide for optimal populations density. A variety of impacts can adversely affect bighorn including recreation use, roads, fences, poor range conditions, fire suppression, diseases, illegal harvest and

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<sup>1</sup> Actual occupied habitats should be remapped and key or critical areas identified for this species.

predation (Dunn 1997). A lack of natural salt deposits required for their diet commonly found bighorn sheep “begging for food” from wilderness recreation users. The NM Department of Game and Fish considered this type of human interaction with bighorn sheep as unhealthy to the species. Cooperative salting in remote locations by the NMGF and Forest Service and the Sikes Act Program seems to have resolved much of this problem.

Prescribed fire can be useful tool in managing bighorn sheep habitat (Peek et al. 1995). Prescribed burning has been widely used to increase the quantity and nutritional quality of bighorn sheep forage throughout North America (Easterly et al. 1991). Since both positive and negative effects can occur from burning bighorn sheep range, a well-thought-out plan must be developed before fire is considered for use on their range. Plans must consider:

- 0 condition of plants
- 1 plant response to burning
- 2 adjacent conifers (the possibility of creating more open range exists if conifer stands or tall shrub fields occur next to currently used ranges.)
- 3 limiting factors (factors that may limit bighorn sheep populations should be identified, and an evaluation made as to how burning will effect these limiting factors)
- 4 lungworm (lungworm infections can possibly be altered by reducing bighorn sheep concentrations; however, if burns are small and concentrate bighorn sheep, results could be negative. If burns disperse populations, the effects could be positive)
- 5 competition from other ungulates attracted to burns (Peek et al. 1984).

Habitat conditions in the Pecos Wilderness are fair and stable, while the Wheeler Peak Wilderness, Columbine-Hondo Wilderness Study Area and the Latir Peak Wilderness are generally good and stable. There are a few locations where utilization is heavy, but these are isolated. The limiting factor for the bighorn is severe winter conditions when quality and quantity of forage can fluctuate significantly. Recent Forest Service management trends places more emphasis on thinning conifer encroachment and prescribed burning in transitory range, thus improving the quality of bighorn sheep habitat.

## **Population Trend And Viability**

Rocky Mountain bighorn are relatively widespread in western North America from central British Columbia and Alberta south to Colorado, although populations are smaller than in the past. In some areas, the species has been threatened by habitat changes resulting from fire suppression and human encroachment, as well as by competition with feral and domestic livestock.

Rocky Mountain bighorn were never prevalent in New Mexico, historically occurring in only four to six populations. Currently, six populations comprised of about 570 animals are found in the state. Bighorn sheep are usually characterized by low reproduction rates, long life spans and populations that remain stable at near carrying capacity (Dunn 1996). Dunn has observed that populations with more than 100 animals normally have the best chance for long-term persistence. Most mortality occurs during winter when weather is severe and forage quality and availability are low. A long-range (1996 - 2002) plan for management of bighorn in New Mexico was published in 1996 (NMDGF 1996).

The NatureServe database ([www.natureserve.org/explorer](http://www.natureserve.org/explorer)) documents that throughout its range, the conservation status of Rocky Mountain bighorn sheep is ranked globally as “G4” and “T4” for populations, in other words, they are apparently secure. Reasons given for the status ranking include the species being relatively widespread in western North America, although populations are smaller than in the past. In some areas bighorn are threatened by habitat changes resulting from fire suppression and human encroachment; also by competition with feral and domestic livestock.

Bighorn sheep are very susceptible to diseases. Incidence of lungworm infestation approaches 100 percent in some herds, although the level of individual infection varies depending upon sheep and domestic livestock densities, range conditions, climate, season, and age. A significant correlation exists between the intensity of the lungworm infestation and the amount of precipitation in the spring of the previous year.

The future of bighorn sheep depends on the preservation and improvement of critical native ranges. Bighorn sheep are poor competitors with other wild and domestic ungulates, and their range is diminishing. The effect of domestic livestock grazing on bighorn sheep is controversial and depends on the proximity and population size of competing species. Domestic livestock have been reported to have little deleterious effect if they do not graze on critical bighorn sheep winter ranges. Nevertheless, extensive competition by livestock persists and is one of the reasons for the decline in density of bighorn sheep populations (Chapman et al 1982). Elk (*Cervus elaphus*) and mule deer (*Odocoileus hemionus*) can also be serious competitors with bighorn sheep on marginal habitat (Chapman et al 1982, Peek, James. 1985).

Human activities on bighorn sheep range are the most widespread threat to bighorn sheep (Boyd et al. 1986). These activities reduce the number of bighorn sheep by decreasing habitat, causing bighorn sheep to reduce or terminate their use of prime habitat, stop migration, or split from large herds into smaller herds (Boyd et al. 1986, Van Dyke et al. 1983). Human activities responsible for declines in sheep use of an area include hiking and backpacking, snow skiing, fishing, motor biking, four-wheel-drive vehicle use, construction and use of roads, urban development, and recreational development. When bighorn sheep are pushed from prime to marginal habitat, mortality usually increases and productivity decreases. Some herds have adapted to human activity (Van Dyke et al. 1983).

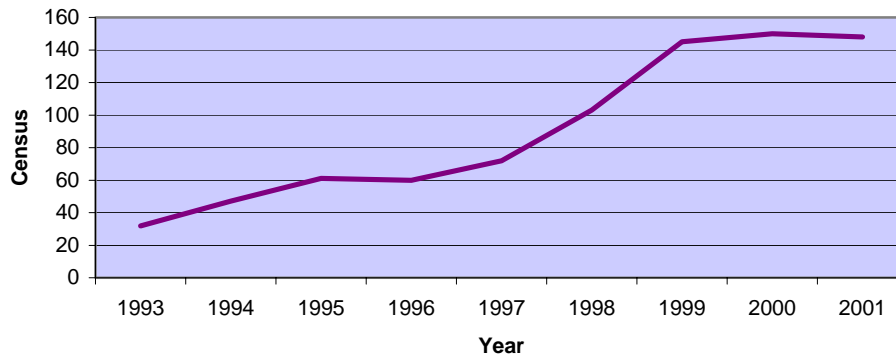
### **Camino Real Ranger District, Pecos Wilderness**

Native bighorn sheep populations were extirpated around the turn of the century, likely due to unregulated hunting and disease transmission from domestic sheep. Reintroduction of bighorn began in 1932, but was not successful. Again bighorn were reintroduced into the Pecos Wilderness in the 1960's. An extensive habitat distribution and food habits evaluation was conducted from 1976 to 1978. The continuous alpine habitat in the Pecos Wilderness is estimated at 27 square miles. The estimated carrying capacity based on winter range was thought to be 175 to 330 animals.

The population estimates are: 1989--404 animals, 1990--406, 1991--398, 1992--396, 1993--401. These are based on actual counts, which are considered less than the estimated numbers. The population estimates for 1994, 1995 and 1996 are 381, 318 and 349 respectively (Hass 1995). In 1993, the NM Department of Game and Fish determined that the Pecos population, which has consistently increased, would be a primary source of sheep for transplant to other areas thought to have suitable habitats. This population has fluctuated between 300 and 400 with high winter mortality in the lamb and yearling cohorts during severe winters. This strongly suggests a density dependent carrying capacity tightly linked to winter severity with a maximum carrying capacity of around 400 animals (Rominger 2001).

### Questa Ranger District, Wheeler Peak Wilderness and Latir Wilderness

In 1993, 33 animals from the Pecos herd were transplanted to the Wheeler Peak Wilderness and adjacent Columbine-Hondo Wilderness Study Area (NMDGF 1993). The population has increased from an estimated 180 individuals, with a projected or potential population of up to 275. Recent estimates suggest that 275 is likely over the carrying capacity, and at a population density of 17 bighorn/km<sup>2</sup>, the population objective would be 180 animals. Population census has been conducted annually since 1993.



**Figure 1. Wheeler Peak Transplant Bighorn Sheep Population Census 1993 to 2001**

Expecting the Latir Peaks to be equally suitable as the Wheeler Peak area, the NM Department of Game and Fish relocated 56 bighorn sheep from the Pecos Wilderness to the Latir Wilderness in August 2001. Monitoring of the herd later in September 2001 indicates healthy individuals and an especially vigorous lamb crop.

The expansion of transplanted populations in the Wheeler Peak and Latir Peak areas demonstrates the success of Rocky Mountain bighorn sheep and species viability in New Mexico. Even when the Pecos Wilderness population is used as the source for transplantation, it is able to effectively recover. **The population trend for Rocky Mountain bighorn on the Carson National Forest is up.** Based on available data and the anticipated management of bighorn sheep habitat in the foreseeable future, the Carson National Forest is sustaining viable populations of the species in each of the three areas of the Forest with potential habitat.

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